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P/1071-1201

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Kenji MATSUO et al. Date: June 24, 2004

Serial No.: 09/699,670 Group Art Unit: 2834

Filed: October 30, 2000 Examiner: Julio C. Gonzalez

For: ULTRASONIC VIBRATION APPARATUS USE AS A SENSOR HAVING A PIEZOELECTRIC ELEMENT MOUNTED IN A CYLINDRIAL CASING AND GROOVES FILLED WITH FLEXIBLE FILLER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Sir:

In accordance with the undersigned's telephone conference with Examiner Gonzalez on June 24, 2004, enclosed please find further copies of the Appeal Brief, in triplicate, together with a copy of the stamped return receipt postcard from the U.S. Patent and Trademark Office, indicating prior receipt of the Appeal Brief on July 28, 2003 and check # 12085 (copy attached).

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Louis C. Dujmich
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Date of Signature

Respectfully submitted,

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First Inventor MATSUO et al. Date 7/23/03
The PTO has received: Last Due Date: ____________

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re Patent Application of:	New York, New York
Kenji MATSUO et al.	Date: July 23, 2003
Serial No.: 09/699,670	Group Art Unit: 2834
Filed: October 30, 2000	Examiner: Julio C. Gonzalez

For: ULTRASONIC VIBRATION APPARATUS USE AS A SENSOR HAVING A PIEZOELECTRIC ELEMENT MOUNTED IN A CYLINDRICAL CASING AND GROOVES FILLED WITH FLEXIBLE FILLER

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

APPEAL BRIEF UNDER 37 C.F.R. §1.192

Sir:

This appeal concerns the propriety of the Examiner's final rejection mailed December 3, 2002 in connection with the above-identified application.

A Notice of Appeal was filed on June 2, 2003. Accompanying this Appeal Brief is our check No. 2085, in payment of the fee set forth in 37 C.F.R. §1.17(c).

The present Appeal Brief is filed in triplicate in accordance with 37 C.F.R. § 1.192(a).

In the event that the actual fee is greater than the payment submitted, is inadvertently not enclosed, or any additional fee due during the pendency of this application is not paid the Patent and Trademark Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

Status of Claims

Claims 8-23 are pending.

Claims 8-11, 16-18, 22 and 23 have been rejected and are on appeal herein.

Claims 12-15 and 19-21 have been objected to and are on appeal herein.

Claims 1-7 have previously been canceled without prejudice.

Summary of Invention

The present invention is directed to a miniaturized ultrasonic vibration apparatus, such as an ultrasonic sensor, having narrow directivity characteristics without necessitating an increase in frequency and while maintaining a restricted size that is common to that of an ultrasonic sensor.

As discussed on pages 1-4 of the specification and depicted in FIG. 9A of the present application, the prior art teaches ultrasonic vibration devices, such as ultrasonic sensors, that utilize a casing having a piezoelectric plate (vibration plate) closing one of the casing's ends. A piezoelectric element having an electrode is mounted to the vibration plate within the casing. Applying a voltage to the piezoelectric element creates a bending vibration at a predetermined resonance frequency. Similarly, the vibration plate conducts the bending vibration. As such, ultrasonic waves having a spherical wave front are propagated through air, as depicted in FIG. 9B. The ability to produce a narrowed directivity with an ultrasonic sensor is directly related to the diameter and thickness of the vibration plate and the wavelength of the supplied frequency – i.e., increasing the diameter, thickness, or the supplied frequency increases the narrowness of directivity. Among the problems encountered by prior art devices, as described above, is their inability to achieve substantially narrowed directivity without requiring too large an apparatus and/or operating frequency.

In contrast, the structure of the apparatus in claim 8 of the present application creates a narrowed directivity without requiring too large a device and/or too high an operating frequency. As claimed, a support member is coupled to a disklike vibration plate along a circular path located inside the outer periphery of the vibration surface. Accordingly, the vibration plate is divided into an inner region, inside the circular path traced by the support member, and an outer region, outside the circular path traced by the support member. (Spec., page 8, lines 3-6; page 4, lines 8-19; <u>see</u> <u>also</u> FIGS. 1A-C). A piezoelectric element is bonded to the inner region of the vibration plate. (Spec., page 8, lines 6-8). Applying an alternating current across the electrodes of the piezoelectric element creates a bending vibration which is conducted by the vibration

plate. (Spec., page 8, lines 13-17). As a result, same-phase sound waves propagate from the vibrating inner and outer regions respectively. The path along which the supporting member is mounted to the vibration plate serves as a node of vibration while the central portion of the inner region and the distal periphery of the outer region serve as antinodes. (Spec., page 8, lines 18-21). The sound waves originating from the outer region interfere with the sound waves originating from the inner region to create condensed regions of sound waves above the inner region, (Spec., page 9, line 13 to page 10, line 12), as is illustrated in FIG. 2. The maximized sound pressure resulting from optimally interfering sound waves in the forward direction perpendicular to the vibration plate creates the desired narrow directivity characteristics. (Spec., page 10, lines1-12).

Claim 22 includes the above noted features of claim 8. Moreover, claim 22 specifies that the support member is disposed on a cylindrical base member, wherein both members are on the same side of the vibration plate.

Claim 23 also includes features analogous to those of claim 8. Moreover, claim 23 specifies that the vibration plate is free from support in its outer region.

Additionally, the inventors found that when forming a node with the support member, the primary vibration of the inner region and the secondary vibration of the outer region create a risk of degradation of the resultant sound waves due to reverberation. This problem arises because after receiving a burst signal the outer region continues to vibrate after the inner region ceases to vibrate. Accordingly, to solve this problem, one may adjust the width of the supporting element to create a wider node. However, increasing the width of the supporting element deteriorates sound pressure, sensitivity, and directivity of the ultrasonic vibrating apparatus. Therefore, a flexible filling material having a hardness lower than that of the casing and or supporting member may be placed under the otherwise unsupported outer region of the vibration plate. As a result, after a burst signal for driving the ultrasonic vibration apparatus, vibration in the outer region is rapidly damped and reverberation characteristics are effectively improved as shown in Figs. 6 and 7.

The inventors have also found that by appropriately selecting the hardness and the elongation of the filler, both reverberation characteristics and directivity characteristics can be determined to optimal values within a predetermined range. (See, e.g., FIGS. 6A and 8).

Issues

Would the subject matter recited in claims 8-23 (reproduced in the attached appendix) be obvious at the time of invention to one of ordinary skill in the art under 35 U.S.C. § 103 (a) over Yamamoto et al. (U.S. Patent No. 5,955,821), in view of Thurn et al. (U.S. Patent No. 5,659,220), and further in view of Osawa (U.S. Patent No. 4,983,471)?

Grouping of Claims

Claims 22 and 23 are believed to be independently patentable. Claims 8-21 stand and fall together.

Argument

I. Claims 8-21, 22 and 23 Are Patentable Over Yamamoto et al. In View of Thurn et al. and Osawa

Yamamoto et al. (U.S. Patent No. 5,955,821) (hereinafter "Yamamoto"), in view of Thurn et al. (U.S. Patent No. 5,659,220) (hereinafter "Thurn"), and further in view of Osawa (U.S. Patent No. 4,983,471) (hereinafter "Osawa") does not render the pending claims of the present application obvious under 35 U.S.C. § 103, because the cited references do not disclose every element of the current invention, nor is there a suggestion or motivation to one skilled in the art to combine the above cited references.

A. The Terms "inner and outer regions" of Claim 8 Should Be Given A Reasonably Broad Interpretation As Defined In The Specification

It is the Examiner's position in the Final Office Action (hereinafter "FOA") that "[t]he claims are not specific enough as to give physical or any structural description of the inner and outer regions." (FOA, Dec, 3, 2003, page 4, lines 3-4). To the contrary, the features recited in

claim 8 are defined within the specification to require a more specific structural requirement for the creation of the "inner and outer regions" than is found in the cited prior art.

Claim 8 of the present application relates to "[a]n ultrasonic vibration apparatus, comprising: a disk like vibration plate having a circular vibration surface, said vibration surface having an outer periphery; <u>a support member coupled to said disklike vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions</u>; and a piezoelectric element coupled to a central region of said disk-like vibration plate to cause said inner and outer regions to vibrate in substantially the same phase. (Claim 8 (emphasis added)).

In order to properly interpret claims during examination, the Examiner must give them their "broadest <u>reasonable</u> interpretation <u>consistent with the specification</u>." <u>In re Hyatt</u>, 211 F.3d 1367, 1372, 54 U.S.P.Q.2d (BNA) 1664, 1667 (Fed. Cir. 2000) (emphasis added). "[T]he words of the claim must be given their plain meaning unless applicant has provided a clear definition in the specification. <u>In re Zletz</u>, 893 F.2d 319, 321 13 U.S.P.Q.2d 1320, 1322 (Fed. Cir. 1989). Additionally, "Applicant may be his or her own lexicographer," M.P.E.P. § 2111.01, accordingly, "[w]hen the specification states the meaning that a term in the claim is intended to have, the claim is examined using that meaning, in order to achieve a complete exploration of the applicant's invention and its relation to the prior art." M.P.E.P. § 2173.05 (a); <u>In re Morris</u>, 127 F.3d 1048, 1054, 44 U.S.P.Q.2d (BNA) 1023, 1027 (Fed. Cir. 1997). Therefore, if the specification defines terms appearing in the claims, then "the specification can be used in interpreting claim language." <u>In re Vogel</u>, 422 F.2d 438, 441, 164 U.S.P.Q. 619, 622 (CCPA 1970).

The Examiner's interpretation of claim 8 to disclose "an inner and outer region on a vibration plate," (FOA, page 4, lines 4-5), is an unreasonably broad interpretation when viewed in light of the specification. To support this argument, the Examiner reasons that <u>Yamamoto</u> discloses a "plate 5 [that] vibrates together with the piezoelectric disc 6", and therefore "a disk may have an inner and outer region and if the whole disk vibrates, the inner and outer parts of the disk will also vibrate." (FOA, Dec, 3, 2003, page 4, lines 5-9 (citations omitted)). Leaving the Examiner to question: "What is an outer region? An inner region?" (<u>Id.</u> at line 9).

In accordance with the above standard, the answer to Examiner's questions is: The "inner and outer regions" as recited in claim 8 are structural features of the vibration surface created by the division of the vibration surface by the support member along a path inside the periphery of the vibration plate. The inner region is the area inside the circular path traced by the support member, and the outer region is the area between the circular path traced by the support member and the peripheral edge of the vibration plate. (Spec., page 8, lines 3-6, page 4, lines 8-19; see also FIGS. 1A-C). Within the specification, Applicants chose the terms "inner and outer regions" to define the distinct structural division of the vibration surface by coupling the support member along a circular path inside its peripheral edge. Id. Accordingly, Applicants, as their own lexicographer, provided a clear and consistent definition of the inner and outer regions with respect to the support member in the specification.

In view of the definitions provided by the specification, (See Spec., page 8, lines 3-6; page 4, lines 8-19; FIGS. 1A-C), the meaning of claim 8 is sufficiently clear to one skilled in the art without having to import structural limitations from the specification. As characterized by claim 8 in light of the specification, to create "inner and outer regions," as defined by the applicants, structurally requires the proper placement of the support member "inside said outer periphery of said vibration surface." (Claim 8). Therefore, one of ordinary skill would understand that the inner and outer region exist in relation to the placement of the support member, and is not merely an arbitrary designation of locality relevant to the center of the vibration plate, but is a distinct structural feature created with respect to the support member. Accordingly, for at least the above stated reasons, the Examiner's failure to recognize the necessary relation between the support member coupling along a path inside the outer periphery as the necessary structural feature for creating the inner and outer regions is an unreasonably broad interpretation of claim 8 that is inconsistent with the definitions provided in the specification.

Further contrary to the Examiner's assertions, the location of the support member inside the outer periphery of the vibration plate, and the creation of inner and outer regions on the vibration plate with respect to the path drawn by the support member coupling to the vibration plate are structural elements, not merely functional properties, that distinguish the claimed invention from Yamamoto. Because a structural element, such as the "inner and outer regions,"

carry inherent functional properties does not make them any less structural in nature. For at least the above stated reasons, the inner and outer regions are structural features of claim 8.

B. Yamamoto in view of Thurn and Osawa Does Not Disclose or Suggest The Invention Of Claims 8-21

Having properly interpreted claim 8 in light of the specification, it is apparent that Yamamoto, in view of Thurn and Osawa, does not disclose or suggest the apparatus of claim 8.

Yamamoto purportedly relates to "a piezoelectric electro-acoustic transducer achieving an extra-low resonant frequency without requiring any modification in a diameter and a thickness of the piezoelectric diaphragm, and also without necessitating the use of any special casing members therefor." (Yamamoto, col. 2, lines 46-52). As characterized by the Examiner, "the piezoelectric acoustic transducer has a disk vibration plate 5, a hollow cylindrical support member 3 coupled to the disk 5, a piezoelectric element 6 coupled to the center of the disk 5, and implicitly disclosed a cylindrical base member 2 with a wall thickness greater that the wall thickness of support member 3." (FOA, page 2). The "plate 5 vibrates together with the piezoelectric disc 6." (Yamamoto, col. 5, lines 44-5, 55-6). "Also, the Examiner asserts that "a groove 2d is defined in the base member 2 and a damping member 3d is located in the groove 2d." (FOA, page 2). The piezoelectric diaphragm, having plate 5 is supported on its periphery for achieving the intended decrease in resonant frequency. (Yamamoto, col. 2, lines 55-7; col. 3, lines 1-12). Additionally, inclusion of at least one gap between peripheral supports can provide more favorable stress transmission suppression, as when "the piezoelectric diaphragm 4 [is] sandwiched [or clamped] between the ring-like support planes 2c [and 3c] at specific portions where the plural projections 5a are provided." (Yamamoto, col. 5, lines 60-5; see also Yamamoto, FIG. 1).

Thurn purportedly relates to a compact ultrasonic transducer having small side lobe radiation characteristics. (Thurn, Abstract). As characterized, the transducer has a piezoelectric transducer element (1) which is bonded over its main surface (7) to a disk-shaped λ/4 matching element (2), it being the case according to the invention that the circumferential surface (3) of the λ/4 matching element is profiled with a notch (4) of suitable depth (5). (Id.; see also Thurn, FIGS. 1,4, and 6-8). "The desired "advantageous improvements on the sound-radiation front

surface[, namely, a high sound pressure,] is achieved by contouring the lateral surface with notches 4." (Thurn, col. 4, lines 41-3).

Osawa purportedly relates to an ink-jet head, and method of manufacturing thereof. (Osawa, col. 1, lines 9-11). As characterized, a diaphragm 115 is supported by a support member 110 and a abase member 121. The rectangular diaphragm 115 is supported on a support plate 10 and base member 112. (Osawa, cols. 12-8). Forceful injection is achieved by employing multiple piezoelectric elements. (Osawa, col. 6, lines 1-40). As characterized, Osawa is designed to overcome various prior art problems, namely: the structural difficulty of miniaturizing the ink-jet head, the difficulty of electrically connecting the power source while maintaining reliable connections and decreasing the necessary manufacturing steps, preventing the loss of ink moisture so that the nozzle holes will not clog, minimizing energy loss and interferences between pressurizing chambers, and decreasing the degree of difficulty of manufacture. (Osawa, cols. 3 and 4). A matrix of piezoelectric actuators 111 are arranged in a paired series along base plate 110; supports 114a are bonded onto both end portions of the base plate 110 and between the pairs of laminated piezoelectric actuators 111. A metal diaphragm 115 is bonded to the upper surface of the laminated piezoelectric actuators 111 and the supports 114a and 114b.

To reject a claim as obvious under § 103 (a), the Examiner must demonstrate a suggestion or motivation to combine references, a reasonable expectation of success, and that the suggested combination or references teaches each and every limitation of the claim. See In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d (BNA) 1438 (Fed. Cir. 1991); M.P.E.P. § 2142. "[A]pparatus claims must be structurally distinguishable from the prior art", M.P.E.P. § 2114, but "there must [also] be some suggestion or motivation" to modify the reference or combine the teachings. In re Kotzab, 217 F.3d 1365, 1371, 55 U.S.P.Q.2d (BNA) 1313, 1318 (Fed. Cir. 2000) (References individually teaching all aspects of the claimed invention were insufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings not the references.). In accordance with the above standard, the combination of Yamamoto, with Thurn and Osawa does not disclose, teach, or suggest "a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said vibration surface so as to divide said vibration surface into inner and outer regions," as recited in claim 8.

As described above, the "hollow cylindrical member 3" of Yamamoto is not "coupled to the disc-like vibration plate along the circular path located inside the outer periphery of the circular vibration surface" as recited in claim 8, but rather is mounted along the periphery of the piezoelectric disk. Furthermore, Yamamoto does not disclose a division of the "vibration surface into inner and outer regions" as required by claim 8. Rather, "the piezoelectric diaphragm 4 [is] sandwiched [or clamped] between the ring-like support planes 2c [and 3c]" along the periphery, as shown in FIG. 1, at specific portions where the plural projections 5a are provided." (Yamamoto, col. 5, lines 60-5). As such, the hollow cylindrical member 3 of Yamamoto is not coupled to the vibration plate "inside said outer periphery of said circular vibration plate" and fails to "divide said vibration surface into inner and outer regions,"and in particular, "inner and outer regions" that "vibrate in substantially the same phase," as defined in the specification and recited in claim 8 of the present application. The projections 5a are clamped between surfaces 2c and 3c and thus are not free to vibrate. (Yamamoto, col. 5, lines 60-5; see also, Yamamoto FIG. 1).

Regarding Thurn, Applicants recognize that this reference refers to the creation of narrowly directive sound waves. However, Thurn, like Yamamoto, does not teach the use of "a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said vibration surface so as to divide said vibration surface into inner and outer regions," as recited in claim 8. (Claim 8 (emphasis added)). As described above, Thurn achieves narrowed directivity by "contouring the lateral surface [of the vibration plate] with notches 4," but does not employ the use of a support member to create the multiple regions of wave propagation. (Thurn, col. 4, lines 41-3). As such, Thurn does not disclose the use of "a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said vibration surface so as to divide said vibration surface into inner and outer regions," as recited in claim 8.

Regarding Osawa, reference to a support member 110 and base member 121 for supporting the vibrating plate, does not in any way or fashion "divide said vibration surface into inner and outer regions" as recited in claim 8. Further regarding Osawa, the structural dissimilarity between the piezoelectric devices of Osawa and the present application are evident. Osawa fails to disclose or suggest anything remotely resembling the ultrasonic vibration

apparatus of the present invention. (Osawa, cols.12-18; Osawa, FIGS. 5, 9, and 10). Amongst the numerous distinguishing factors, Osawa dramatically differs structurally by employing the use of multiple piezoelectric elements to achieve precise and forceful ink-ejection. (Osawa, at col. 6 lines 1-40). Osawa, therefore, does not teach the use of "a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said vibration surface so as to divide said vibration surface into inner and outer regions . . . [wherein] said inner and outer regions vibrate in substantially the same phase" as required by claim 8.

Accordingly, neither Yamamoto, Thurn or Osawa disclose "a support member coupled to said disklike vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and . . . said inner and outer regions to vibrate in substantially the same phase. (Claim 8 (emphasis added)).

Claims 9-21 ultimately depend from independent claim 8 and, therefore, include the features of claim 8. Despite the Examiner's arguments to the contrary, these claims are also patentable over the prior art for at least the same reasons as claim 8. Additionally, as a premise for rejecting claims 8-11, 16-18, 22 and 23 the Examiner erroneously cites "a cylindrical base member 2 with a wall thickness greater than the wall thickness of support member 3", and references Yamamoto. (See FOA, Dec. 3, 2002, page. 2). However, such a limitation is not recited until claim 12, the very claim which the Examiner noted as being allowable if rewritten in independent form.

C. Yamamoto Does Not Suggest of Motivate One Skilled In The Art To Combine Yamamoto With Thurn or Osawa

The Examiner stated that in view of the prior art it would have been obvious "to design a vibration apparatus as disclosed in Yamamoto and to modify the invention by explicitly providing a support member with a different wall thickness for the purpose of improving oscillations and reducing power losses and to place a support member on top of a base member for the purpose of reducing interference in a vibrator as disclosed in Osawa." (FOA, page 5). However, as noted above, Yamamoto speaks to the problem of forming an electro-acoustic transducer having a substantially decreased resonant frequency. Yamamoto lacks suggestion or

motivation to alter the directivity of sound waves by mounting the vibration plate at a location other than at its periphery. Indeed, Yamamoto addresses only the problem of "achieving extra low resonance frequency without requiring any modification in the diameter and a thickness of the piezoelectric diaphragm and also without the necessity of using any special casing members therefor." (Yamamoto, col. 2, lines 46-52). Yamamoto does not teach or suggest an apparatus for creating a narrowed directivity with an increased sound density at a predetermined location. A person skilled in the art would not consider the teaching of Yamamoto as being relevant to the manufacture of narrowly directive ultrasonic sensors, which is the field of endeavor of the present invention.

Further regarding Yamamoto, mounting the support member along a circular path inside the periphery of the vibration plate would render Yamamoto inoperable for its intended purpose. In Yamamoto a substantially reduced resonant frequency is achieved by supporting "the piezoelectric diaphragm 4 . . . at selected points [5a] along its outer periphery." (Yamamoto, col. 5, lines 65-67; see also FIG. 2). In contrast, moving the support member inward from the periphery shortens the wave length and inherently creates an increased resonant frequency. Therefore, Yamamoto does not suggest the use of "a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said vibration surface so as to divide said vibration surface into inner and outer regions," as recited in claim 8.

In Thurn, narrowly directive sound waves are achieved "by contouring the lateral surface with notches 4." (Thurn, col. 4, lines 41-3). The structural differences between Thurn's device and the present invention are significant. Thurn only teaches the use of contouring in the periphery of the vibration plate and does not teach nor suggest to one of ordinary skill in the art to mount the support member along a circular path in from the periphery of the vibration plate. The structure of Thurn is not only dissimilar, but fails to suggest or motivate one skilled in the art to implement the support member to divide the vibration plate into inner and outer regions so as to achieve narrowed directivity.

If, arguendo, motivation existed for combining Yamamoto with Thurn, these references would not teach an ultrasonic transducer achieving narrowed directivity. Incorporating the teachings of Yamamoto would lead one skilled in the art to clamp a vibration plate at is peripheral edge. (Yamamoto, col. 5, lines 65-7). In contrast, the peripheral edge of the vibration

plate in Thurn must vibrate to form an increased sound pressure. (Thurn, col. 4, lines 41-43). Incorporating the teachings of Yamamoto with Thurn prevents the creation of vibrations at the peripheral edge of the vibration plate, and thus prevents the creation of peripheral antinodes as is necessary for creating an increased sound pressure as taught by Thurn. (Thurn, col. 4, lines 41-43). Rather, the combined teachings would create a structure that generates a single wave node from the center of the vibration disk, the very problem the present invention set out to solve.

Osawa fails to suggest a disc-like vibration plate having outer and inner regions defined by a support member and whereby the outer and inner regions vibrate in substantially the same phase. In fact, as discussed above, Osawa fails to disclose anything remotely resembling the ultrasonic vibration apparatus according to the present invention. Accordingly, One skilled in the art would not be motivated to combine Osawa with the teachings of Yamamoto or Thurn.

Accordingly, claim 8 is patentable over Yamamoto, Thurn and Osawa, because they do not disclose the apparatus of claim 8 nor does there exist a suggestion or motivation to combine the cited references in the manner suggested by the Examiner.

Similarly, the Examiner erroneously argues that projection 3d of FIG. 1 of Yamamoto is "a damping member" as claimed in claim 13 of the present application; however, there is no disclosure in Yamamoto to support this assertion. Quite to the contrary, it is described simply as "a rigid projection, which is provided for rigid engagement with the recess 2d disposed at the first cylindrical casing 2." (Yamamoto, col. 5, lines 28-32). Therefore, the above cited portions of Yamamoto do not further the Examiner's argument for obviousness, but rather, exemplify an additional erroneous application of the Yamamoto reference.

D. The Prior Art Does Not Disclose or Suggest The Apparatus Of Claim 22

Claim 22 includes analogous features to those of claim 8, which distinguish it from the prior art. Therefore, Yamamoto in view of Thurn and Osawa does not disclose or suggest the apparatus of claim 22 for the same reasons discussed above in connection with claim 8.

Moreover, Yamamoto does not disclose a casing and support member that are "disposed on the same side of the vibration plate," as recited in claim 22. Rather, Yamamoto teaches that the casing and support member are to be disposed on opposite sides. (Yamamoto, col. 5, line 46

to col. 6, line 3 ; see also, FIG. 1). This prevents the metal plate of Yamamoto from vibrating freely in both an inner and outer region of the vibration plate. Therefore, the apparatus of claim 22 has been found to enhance the advantages described above with respect to the claimed invention.

Neither Yamamoto, Thurn, or Osawa discloses or suggests that the casing and support member are "disposed on the same side of the vibration plate," as required by claim 22.

E. The Prior Art Does Not Disclose Or Suggest The Apparatus Of Claim 23

Claim 23 includes features analogous to those recited in claim 8. Therefore, claim 23 should be patentable for the same reasons discussed above in connection with claim 8.

Moreover, in claim 23, "the vibration plate is free from support in said outer region," in contrast to Yamamoto, wherein the piezoelectric diaphragm 4 is physically supported in such a way that it is fixed between the ring-like support plane 2c of the first cylindrical casing 2 and the ring-like support plane 3c of second cylindrical casing 3. Accordingly, even when combined with the Thurn et al. or Osawa patent, the claimed invention is not disclosed.

Neither Thurn or Osawa discloses or suggests a vibrating plate having inner and outer regions defined by a support member wherein both regions are free to vibrate. Accordingly, even when combined with Yamamoto the present invention is not taught or suggested.

Conclusion

For the foregoing reasons, Applicants respectfully submit that the Examiner's citations do not make obvious the claimed subject matter as a whole. Accordingly, the rejections of claims 8-23 under 35 U.S.C. § 103 should be reversed.

If this communication is filed after the shortened statutory time period has elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. §1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. §1.135. The fee under 37 C.F.R. §1.17 should be charged to our Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on July 23, 2003

Louis C. Dujmich
Name of applicant, assignee or Registered Representative

Signature

July 23, 2003
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Respectfully submitted,

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APPENDIX

The Claims on Appeal Are:

8. An ultrasonic vibration apparatus, comprising:

a disk like vibration plate having a circular vibration surface, said vibration surface having an outer periphery;

a support member coupled to said disk like vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and

a piezoelectric element coupled to a central region of said disk-like vibration plate to cause said inner and outer regions to vibrate in substantially the same phase.

9. An ultrasonic vibration apparatus according to claim 8, wherein said circular path defines an amplitude vibration node of said vibration plate.

10. An ultrasonic vibration apparatus according to claim 9, wherein said support member has a hollow cylindrical shape.

11. An ultrasonic vibration apparatus according to claim 10, wherein said support member is coupled to a cylindrical base member having an outer periphery which lies outside of said circular path.

12. An ultrasonic vibration apparatus according to claim 11, wherein said cylindrical base member has a hollow cylindrical shape with a wall thickness that is greater than the wall thickness of said support member.

13. An ultrasonic vibration apparatus according to claim 11, wherein a groove is defined by said base member, said support member and said vibration plate and wherein a vibration damping member is located in said groove.

14. An ultrasonic vibration apparatus according to claim 13, wherein said vibration damping member is formed of a flexible material.

15. An ultrasonic vibration apparatus according to claim 13, wherein said vibration damping member is formed of a softer material than said vibration plate.

16. An ultrasonic vibration apparatus according to claim 11, wherein said vibration plate, said support member and said cylindrical base member are integral with one another.

17. An ultrasonic vibration apparatus according to claim 11, wherein said vibration plate, said support member and said cylindrical base member together define a cylindrical casing closed at one end by said vibration plate.

18. An ultrasonic vibration apparatus according to claim 8, wherein said vibration surface is a flat, planar surface and said inner and outer regions lie in the same plane.

19. An ultrasonic vibration apparatus according to claim 8, further including a groove located directly below said outer region and a vibration damping member located in said groove.

20. An ultrasonic vibration apparatus according to claim 19, wherein said vibration damping member is formed of a flexible material.

21. An ultrasonic vibration apparatus according to claim 19, wherein said vibration damping member is a material which is softer than the material of said disk like vibration plate.

22. An ultrasonic vibration apparatus, comprising:

a disk-like vibration plate having a circular vibration surface, said vibration surface having an outer periphery;

a support member coupled to said disk-like vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and

a piezoelectric element coupled to a central region of said disk-like vibration plate to cause said inner and outer regions to vibrate in substantially the same phase;

further comprising a cylindrical base member on which the support member is disposed, the support member and base member being disposed on the same side of the vibration plate.

23. An ultrasonic vibration apparatus, comprising:

a disk-like vibration plate having a circular vibration surface, said vibration surface having an outer periphery;

a support member coupled to said disk-like vibration plate along a circular path located inside said outer periphery of said circular vibration surface so as to divide said vibration surface into inner and outer regions; and

a piezoelectric element coupled to a central region of said disk-like vibration plate to cause said inner and outer regions to vibrate in substantially the same phase;

further wherein the vibration plate is free from support in said outer region.